AGRIBUSINESS AS AN ENGINE OF GROWTH IN DEVELOPING COUNTRIES

Tyler Holt[*], DevTech Systems, Inc.
Shirley Pryor, U.S. Department Of Agriculture/ERS

JUNE 1999

* Prepared while under contract to USAID's Office of Emerging Markets.

EXECUTIVE SUMMARY

The role of agriculture in the development process is often under-emphasized. Simple, quantitative measures make it seem as if agriculture loses importance as economies grow, so most people conclude that the role of agriculture diminishes as development progresses. In most countries, however, the typical pattern is for agriculture to continue to grow in size and modernize along with the entire economy, even as it declines as a share of total GNP. More importantly, as the entire economy develops, agriculture and related industries become more complex and increasingly integrated with the other sectors in the economy. In fact, a significant portion of the growth which occurs in other sectors of the economy can be attributed to concurrent development and modernization in agriculture.

Agribusiness is the combination of all the inputs and outputs of agriculture. Combined, they represent much bigger shares of the economy than just agriculture alone. In the development process, both agriculture and agribusiness decline relative to other sectors of the economy, but more importantly, the linkages between agribusiness and other sectors of the economy continue to grow and become increasingly complex.

Based on the analysis of eleven input-output tables representing ten low- and middle-income countries, and the United States, this paper presents some important findings on the linkages between agriculture and other sectors of the economy that make up agribusiness. These include:

- The share of agriculture in the economy decreases as development occurs. Regression results based on data covering 65 developing countries over thirty years indicated that for every ten-fold increase in GNP/capita, agriculture's share of GDP declines by 7-8%.

- The share of the agribusiness sector in the economy declines as GNP/capita increases. In India, with the lowest per capita income, agribusiness is 75.8% of the economy. The U.S., on the other hand, has a per capita income of $24,170 and agribusiness represents 7.5% of the economy.

- Basic agriculture becomes a smaller portion of overall agribusiness during the development process, as agribusiness becomes increasingly complex, drawing in other sectors of the economy. Over time, the composition of agribusiness changes as it diversifies away from simple agricultural production and consumption to increasingly complex patterns of processing, distribution, and marketing, bringing in activities from other sectors of the economy. During this period, a higher percentage of agricultural commodities are processed rather than consumed directly. For example, in 1947, approximately one-third of agriculture was used as an input into the other sectors of the economy. By 1992, three-quarters of U.S. agriculture went on to some kind of processing.

- Agriculture becomes less labor-intensive as development occurs and workers are drawn into related agribusiness fields. One of the most noticeable aspects of agricultural development is the increasing degree to which non-labor inputs are used. These include fertilizer and pesticides, tractors and other farm machinery, as well as (and perhaps most importantly) a whole range of marketing and business services.

I. Introduction

The role of agriculture in the development process is often under-emphasized. Simple, quantitative measures make it seem as if agriculture loses importance as economies grow, so most people conclude that the role of agriculture diminishes as development progresses. In most countries, however, the typical pattern is for agriculture to continue to grow in size and modernize along with the entire economy, even as it declines as a share of total GNP. More importantly, as the entire economy develops, agriculture and related industries become more complex and increasingly integrated with the other sectors in the economy. In fact, a significant portion of the growth which occurs in other sectors of the economy can be attributed to concurrent development and modernization in agriculture.

In this study we have measured the size of the agriculture sector and the agribusiness sector in ten emerging markets plus the United States, using data from the Global Trade, Assistance, and Protection (GTAP) project at Purdue University. The GTAP data provide detailed, input-output tables for 37 sectors of the economy in 1992. It allows us to make comparisons between countries at different levels of development, focusing on both the size and composition of agribusiness. (See Appendix A for further information on GTAP.)

The early decades of development economics, i.e. the 1950s and 1960s, were notable for a near-preoccupation with competing theories of development which relied on some pattern of stages of growth centered around a narrowly-defined economic sector. Prevalent among these were Walt Rostow's "stages of growth": Traditional, Preconditions for Takeoff, Take-off, Drive to maturity, and age of high mass-consumption.[1] The notion that the take-off point for rapid economic growth occurred in very narrowly-defined areas of the economy led to the identification by Rostow and others of leading sectors which were thought to be instrumental in propelling the economy forward, as an engine of growth. In the most common adaptation, the take-off stage required an increase in the rate of productive investment, the development of one or more key manufacturing sectors, and the emergence of a political and institutional framework that can enable entrepreneurial activity in the "modern" sector.

Albert Hirschman thought that development efforts should be focused where the inter-sectoral linkages would be the greatest -- in industry, not agriculture. A proponent of "unbalanced development", he advocated that development policy should re-enforce the disequilibria in an economy rather than work to eliminate it.[2] Thus, developing countries could achieve rapid economic growth the same way that wealthy countries did in the past, through industrialization.

Johnston and Mellor (1961) refuted this kind of industrialization strategy by arguing that there were, in fact, strong linkages to be found between agriculture and other sectors of the economy. Increasingly, much research has focused on the importance of taking advantage of these linkages to promote economic development; it is the amalgam of these linked activities which we now refer to as agribusiness.

II. What is Agribusiness?

The concept of agribusiness used in this paper was developed by John Davis and Ray Goldberg in their 1954 book, A Concept of Agribusiness. It consists of the agricultural sector plus those parts of the industrial and service sector which are related to agriculture, either as an input into agriculture or as an affiliated good or service related to the use or consumption of agricultural goods. Data analysis indicates that this agribusiness sector, or the Food and Fiber System (FFS) as it is called by USDA, has a significant role in the development process. A better understanding of agriculture and its linkages to the other sectors would improve development programs and opportunities for increased international trade.

At the time, John Davis was the Director of the Program in Agriculture and Business at the Graduate School of Business Administration at Harvard; Ray Goldberg was an Assistant Professor. Their book discusses the emergence of the term *agribusiness* as a replacement for agriculture in the context of the development process:

> The concept of agriculture as an industry in and of itself or as a distinct phase of our economy was appropriate 150 years ago when the typical farm family not only raised crops and livestock but also produced its own draft animals, tools, equipment, fertilizers, and other production items: processed its own food and fiber; and retailed in the community most of the excess above family needs. Then virtually all operations relating to growing, processing, storing and merchandising food and fiber were a function of the farm. This being the case it was appropriate to think of all such things as within the scope of the meaning of the word 'agriculture'. (p.1)

Our definition of Agribusiness is the same as is used in A Concept of Agribusiness: "*the contribution to all economic activity required to support the delivery of food, clothing and shoes, and tobacco to domestic consumers and to support agricultural exports.*"

Combining the forward and backward linkages of agriculture to obtain agribusiness seems to be the most common method in practice. Newman, et. al. (1989) included in their broad definition of agribusiness the chain from input providers and farm suppliers, assemblers and processors, wholesalers and brokers, importers and exporters, retailers, distributors, and consumers. Also included were goods and services associated with input functions and activities such as research, transportation, packaging, storage, promotion, financial services, and government activities, all to the extent that they are affiliated with agricultural activities.

Chart 1, the Agribusiness Flowchart, identifies the sizes of each agribusiness component for the United States economy in 1947[3]. This flowchart depicts the complex linkages between agricultural production and the affiliated goods and services used to bring agricultural goods to domestic use, consumption, and export. Summed up, the components total approximately $119 billion, or 40% of GNP. Connors, Rogers, Marion, and Mueller (1985) also used the Davis and Goldberg methodology to calculate the size of agribusiness to be about 40% of GNP in 1947.[4]

A somewhat similar approach was applied to a set of countries in the Middle East by Mark Newman and Ismael Ouedraogo of Abt Associates for USAID in 1993[5]. Their estimates showed that although the traditionally-defined agricultural sectors for Morocco, Tunisia and Jordan

appeared small, the related industries making up agribusiness turned out to be greatly significant to the overall economy. Specifically, "...traditional national accounts show that agriculture represents the smallest sector in Morocco (17%), Tunisia (15%) and Jordan (7%). Disaggregation of national accounts to reflect the forward and backward linkages of agriculture shows that the agribusiness sector is a key contributor to national income as measured by GDP. The agribusiness sector is the largest sector in Morocco (48-50 percent of GDP) and Tunisia (40-43 percent), and the second largest after services in Jordan (21-22 percent). In both Morocco and Tunisia, agriculture is the leading component of agribusiness; in Jordan, it is agribusiness services."[6]

The Davis and Goldberg methodology has been applied several times to the U.S. economy by the Economic Research Service (ERS) of the U.S. Department of Agriculture. One ERS report reported the U.S. food and fiber system's share of GNP fell from 20.4% in 1975 to 17.5% in 1985.[7] According to another ERS report, the food and fiber system was $622.6 billion in 1982, equivalent to 19.8% of the U.S. economy (1.9% from the farm sector and 17.9% from food processing, transportation, and other agriculture-related inputs and outputs).[8] By 1992 the food and fiber system had grown to $950.2 billion, equivalent to 15.7% of the U.S. economy.

Proportionally, much more of the food and fiber system was being produced off-farm (1.1% from the farm sector and 14.6% from food-processing, transportation, and other related activities). These figures on the U.S. food and fiber system (or "agribusiness") are shown in Table 1.

Table 1: Size and Composition of the Food and Fiber System (FFS) in the U.S. Economy

	1975	1982	1985	1992
Size of FFS	$325.7	$622.6	$700.8	$950.2
FFS Share of GNP	20.4%	19.8%	17.5%	15.7%
Farm share	2.7%	1.9%	1.8%	1.1%
Non-farm share	17.7%	17.9%	15.7%	14.6%
FFS Composition				
Farm share of FFS	13%	10%	10%	7%
Non-farm share of FFS	87%	90%	90%	93%

Sources: ERS (March 1987) and ERS (July 1995).

Generally speaking, agribusiness includes any economic activity which involves, to a significant degree, agriculture as an input or an output. In addition to the agricultural sector, it includes all the inputs into agricultural processing and all of the marketing, distribution, consumption, and export activities of agricultural production. Therefore agribusiness includes portions of what we would normally classify as "manufacturing" and "services".

Table 2 identifies the seven components of agribusiness defined by their role as an input or output of agriculture. Input-output tables, which break down economic production and usage by

sector, will allow us to create the seven components of agribusiness. We can therefore learn the size and, more importantly, the role of agribusiness by quantifying these components and relating them to the other sectors of the economy.

Table 2: The Components of Agribusiness

Agricultural Inputs	Example	Agricultural Outputs	Example
Value-added	Land, labor, capital	Final consumption and export of unprocessed agriculture	Fresh fruits and vegetables, eggs
Agricultural inputs into the agricultural sector*	Feedgrain, livestock	Agricultural inputs into the agricultural sector*	Feedgrain
Inputs of processed agriculture into basic agriculture	Processed feed and fertilizer, food oils	Agricultural components of food processing	Wheat inputs into bakeries, cotton
Inputs of other goods and services into agriculture	Chemical fertilizer, energy, farm machinery, storage, marketing, distribution, and government services	Agricultural components as inputs into other sectors	Construction, restaurants, textiles, lard, lubricants, trees for lumber

* Only counted once to avoid double-counting. Some agricultural products, such as feedgrain and livestock (for breeding) are themselves used as inputs in the agriculture sector itself. Therefore there is some intersectoral use of agriculture, and in the input-output table aggregation this intersectoral use is only counted once to avoid double-counting.

III. Methodology of Input-Output Table Analysis

The following analysis was done by simple aggregation of categories from Input-Output tables constructed from Purdue University's Global Trade Analysis Project (GTAP) database. The GTAP database was established in 1992 with the objective of assembling and presenting input-output tables for a number of different countries in a similar format. The database combines detailed bilateral trade, transportation, and protection data characterizing economic linkages among regions, together with individual country input-output tables which account for intersectoral linkages within regions. Economic data, tracking the intersectoral flow of goods and services, are available for 37 sectors. We used this database to create tables for 11 countries at different levels of development.

Table 3 shows a sector-aggregated IO table for the U.S. economy in 1992. The 37 sectors used by the GTAP database have been aggregated into three broad categories: Agriculture, Processed Agriculture, and Non-Agriculture. (See Appendix A for a precise definition of these three sectoral aggregates.) We can also read from this table the value-added contributions from land, labor, capital, and taxes that go into each of these sectors. According to this table for the U.S. economy in 1992, inputs into agriculture consisted of: $72,987 million in land, labor, capital, and taxes; $15,667 million in processed agricultural goods; $91,497 million in non-agricultural goods and services; and $62,198 million of agricultural goods (i.e. agricultural goods used for the production of other agricultural goods such as livestock breeding).

The outputs of agriculture are divided between: uses as inputs in other agricultural production (already counted as an input); inputs into processed agriculture ($111,168 million); inputs into non-agricultural sectors ($28,244 million); and the domestic consumption ($35,029 million) and export ($31,547 million) of raw, unprocessed agricultural goods.

Thus, the total size of the combined agribusiness sectors in the United States (1992) is the sum of these seven components, or $448,339 million, equivalent to 7.5% of GDP. Similar calculations of the other ten countries in our sample can be made, and are shown in Table 4: “Composition of Agribusiness in 1992", and the accompanying Chart 2.

IV. Quantitative Results for 11 Economies

Our first premise is to confirm that the size of agriculture and agribusiness gets smaller relative to the overall economy during the development process. This occurs even as agricultural development progresses by building linkages with other sectors creating a more diversified agribusiness sector.

Once we discuss the size and behavior of agriculture during the development process, we investigate the linkages between agriculture and the rest of the economy at different stages of development. Input-output (IO) tables allow us to examine the linkages and calculate the various components of agribusiness. Pioneered by Vasily Leontief over fifty years ago, IO table analysis makes it possible to determine inter-sectoral linkages in an economy, by quantifying the sources and uses of any given commodity at various sectoral levels. For example, an IO table can break down the "cost" of one unit of any commodity by the factors of production (land, labor, and capital) and by the use of intermediate commodities used as inputs.

In this section, unless otherwise specified, the results come from analysis based on the GTAP input-output tables for 1992.

Result 1: The share of agriculture in the economy decreases as development occurs.

Even before analyzing the input-output tables, our preliminary research confirmed that the share of agriculture relative to the entire economy does shrink over time, even as the sector itself grows in size and complexity, and increases its linkages with other sectors. The quantitative analysis using purely cross-sectional data has over-stated this trend in the past, however. It is more accurate to fit a panel data set of cross-sectional, time-series data to a fixed-effects regression model in order to compare historical development patterns across countries.[9] Data on agriculture value-added as a share of GDP was compared with inflation-adjusted GNP per capita for 65 developing countries with populations over 1 million and GNP per capita less than $10,000. Changes in the share of agriculture in GDP were measured in five-year increments for the period 1966-1995.

Very robust regression results, shown in Chart 3, indicate that for every ten-fold increase in GNP/capita, agriculture's share of GDP declines by 7-8%. However, this decline is less than one would assume by just examining cross-sectional data. Agriculture value-added in Indonesia, for example, has declined from 48% of GDP in 1970 to 25% of GDP in 1992. Virtually all countries

have declined in the last twenty years. In the United States, agriculture value added as a share of GDP is presently about 2%.

Result 2: The agricultural sector grows even as its share of the GDP declines.

Table 5 indicates that although the ***relative*** size of the agricultural sector declines, the overall size continues to grow throughout the development process.

Table 5: Share of Agriculture in GDP Declines,
Even as the Sector Grows in Size and Complexity

	Agriculture Share of GDP		Avg. Growth of the Agric. Sector
	70-74	90-93	1970 to 1993
Argentina	10.7	6.7	1.5
Chile	7.0	6.9	4.0
India	44.4	30.8	2.9
Indonesia	39.1	18.6	4.0
South Korea	25.0	7.7	2.0
Malaysia	27.2	17.2	4.1
Mexico	11.2	6.5	2.4
Philippines	30.2	21.6	2.3
Thailand	26.0	12.0	3.8
United States	3.0	1.9	4.4

Source: World Bank, *World Development Indicators*.

Result 3: The share of the agribusiness sector in the economy declines as GNP/capita increases.

Chart 4 indicates the decline in the relative size of agribusiness as the economy grows. In India, with the lowest per capita income, agribusiness is 75.8% of the economy. The U.S., on the other hand, has a per capita income of $24,170 and agribusiness represents 7.5% of the economy. Two interesting findings stem from this result in our research, and can be seen in this chart and the following Chart 5. The first is that agribusiness -- the entire array of goods and services necessary to support the delivery of agricultural goods for domestic consumption, use, and export -- is quite large in less developed countries. The second, more important, finding is that agribusiness as a share of GDP seems to decline more rapidly during the development process than does agriculture, ***not because agribusiness is declining but because the rest of the economy grows rapidly when agribusiness matures***. The next result and chart elaborates on this finding.

Result 4: Basic agriculture becomes a smaller portion of overall agribusiness during the development process, as agribusiness becomes increasingly complex, drawing in other sectors of the economy.

Over time, the composition of agribusiness changes as it diversifies away from simple agricultural production and consumption to increasingly complex patterns of processing,

distribution, and marketing, bringing in activities from other sectors of the economy. During this period, a higher percentage of agricultural commodities are processed rather than consumed directly. Chart 5 shows Agriculture as a share of Agribusiness for ten of the countries studied (agricultural data on Chile was not available). For example, agriculture in India, Indonesia, and the Philippines makes up 35-40% of agribusiness while in the more developed economies of Mexico, Korea, and Argentina it is roughly 25%. Although countries have their own development pattern, a clear downward trend can be seen, showing that narrowly-defined agriculture makes up a declining share of agribusiness as economies develop.

A comparison of the input-output tables for the United States in 1992 versus 1947 shows that agribusiness developed into a highly processed industry. In 1947, approximately one-third of agriculture was used as an input into the other sectors of the economy. By 1992, three-quarters of U.S. agriculture went on to some kind of processing.[10]

Other studies have shown that 'agroindustrial processing' -- the processing of agricultural goods -- makes up a large share of what have been traditionally defined as manufacturing sectors. In many developing countries agroindustrial activity is actually the cornerstone of industrial development. James Austin (1992) showed that agroindustries accounted for 72% of manufacturing output in Somalia, 53% in Pakistan, and 54% in Guatemala.[11]

Simple regression analysis also show that the importance of agroindustrial processing increases with development. GNP per capita (adjusted for purchasing power parity) alone predicts approximately 60% of the extent to which food, beverages, and tobacco are processed in the economy. The results show that every doubling in GNP per capita is associated with an increase in the ratio of agroindustry processing by 9%.[12]

The GTAP input-output tables confirm that there are more active agricultural processing sectors in the more developed countries. For example, about 70% of Indian agribusiness consists of the production and consumption of unprocessed agricultural items, while the comparable figure is about 47% in Brazil, and about 31% in the U.S.[13] These findings from the analysis of the GTAP Input-Output tables are consistent with other evidence on the potential for agribusiness development in India. An industry profile put together by the Federation of Indian Chambers of Commerce and Industry found that only 1.3% of the total Indian fruit and vegetable production gets processed commercially (vs. 70-80% in the U.S.) even though India is the second largest producer of fruits and vegetables in the world.[14]

Table 6 shows how agricultural commodities are either used as inputs into other sectors of the economy or are consumed. Again, we would expect that countries at the lower end of development would consume directly a greater share of the agricultural output than those at the higher end of development. Conversely, a higher proportion of agricultural output goes on to further processing in countries with more developed agribusiness activities.

Table 6: Percentage Breakdown of Uses of Agriculture

	Used as Intermediate Inputs in			Final Consumption by				
	Agric.	Agro-Proc.	Other Sectors	Invest	Hhold	Gov't	Exports	Total Use
India	19.4%	12.5%	5.3%	1.7%	59.0%	0.1%	2.1%	100.0%
Indonesia	3.3%	39.7%	12.5%	0.0%	34.0%	0.0%	10.4%	100.0%
Philippines	7.8%	43.4%	10.0%	5.1%	28.1%	0.0%	5.7%	100.0%
Thailand	4.9%	41.1%	9.3%	1.3%	23.7%	0.1%	19.5%	100.0%
Brazil	12.9%	45.4%	11.0%	2.2%	23.4%	0.0%	5.1%	100.0%
Malaysia	2.9%	25.6%	24.3%	7.4%	15.2%	0.0%	24.6%	100.0%
Chile	11.9%	36.6%	3.5%	3.6%	16.0%	0.0%	28.5%	100.0%
Mexico	10.5%	43.7%	3.6%	1.3%	35.1%	0.4%	5.4%	100.0%
Argentina	8.8%	53.6%	4.2%	2.4%	18.4%	0.5%	12.1%	100.0%
South Korea	6.5%	58.6%	5.8%	2.1%	23.8%	0.0%	3.1%	100.0%
USA	23.2%	41.5%	10.5%	0.1%	12.4%	0.6%	11.8%	100.0%

In countries with more developed agricultural sectors most agricultural commodities are used as inputs into food processing and other sectors. In the U.S., Korea, Argentina, and Brazil, for example, more than 60% of the total output of the agricultural sector is used as an input into further economic activity. By contrast, nearly two-thirds of India's agricultural output is consumed directly, while less than 20% is processed (with the remainder being exported). Household consumption as the final use of agriculture is also high in Indonesia and Mexico, indicating that agribusiness might not be as developed as in the other countries.

Result 5: Processed agriculture contains an increasingly larger percentage of inputs other than basic agriculture as economies modernize.

Table 7 shows how more developed agribusiness sectors require higher percentage inputs of non-agricultural inputs, such as power, agricultural machinery, and agro-services.

Table 7: Share of Cost Inputs into Agriculture

	Electricity, Power, Gas, and Water	Machinery, Equipment, and Engines	Services: including Financial, Legal, Real Estate, Advertising	Total
USA	1.3%	1.6%	18.1%	20.9%
Brazil	0.3%	0.3%	5.3%	5.9%
South Korea	0.2%	0.4%	4.7%	5.4%
Thailand	0.2%	0.7%	2.8%	3.7%
Malaysia	0.4%	1.4%	1.3%	3.1%
Argentina	0.2%	0.5%	2.2%	2.9%
Chile	0.4%	1.3%	1.2%	2.9%
Indonesia	0.1%	0.0%	2.4%	2.5%
Mexico	0.4%	0.4%	1.0%	1.8%
India	0.7%	0.5%	0.1%	1.4%
Philippines	0.0%	0.2%	0.2%	0.4%

The contrast between India and the United States, for example, is drastic. The cost of paddy rice makes up about 69% of the total cost of processed rice in India, while it makes up less than 6% of the total cost of processed rice in the United States. On the other hand, inputs provided by marketing services, transportation, electricity, and power are much more important in the U.S. than in India. Table 8 provides the percentage breakdown of the cost of producing one unit of processed rice in India and in the U.S., and shows that the rice processing industry in the U.S. requires much more energy, fertilizer, marketing, and transportation than it does in India. Also, interestingly, the rice processing sector in the U.S. is actually more labor-intensive than in India since it requires so many inputs from other economic sectors.

Table 8: Breakdown of Input Costs for Rice Processing

	India	United States
Raw, paddy rice	68.6%	5.5%
Electricity and power	0.5%	2.5%
Marketing and transport	4.2%	26.5%
Labor	4.8%	11.1%
Capital	6.4%	11.2%
Other inputs	13.5%	43.2%
All Inputs	100%	100%

Result 6: Agriculture becomes less labor-intensive as development occurs, and workers are drawn into related agribusiness fields.

One of the most noticeable aspects of agricultural development is the increasing degree to which non-labor inputs are used. These include fertilizer and pesticides, tractors and other farm machinery, as well as (and perhaps most importantly) a whole range of marketing and business services. For example, high income countries used an average of 74 kilograms of fertilizer per hectare of arable land in the early 1960s versus only 3 kilograms in low income countries. By the early 1990s, low income countries were using ten times as much (31 kg per hectare) as before, but still far less than in high income countries (122 kg per hectare).

During the development process, agribusiness linkages emerge which draw in non-labor inputs creating a more productive agricultural sector. Increased inputs from other sectors of the economy, in turn, create their own increased demand for labor. As a share of the total production costs going into agriculture, ***direct*** labor costs tend to decrease with agribusiness development. One study found that labor costs amounted to 45% of the total cost of crop production in the Philippines in 1983.[15] Similar calculations from the GTAP tables (representing 1992) reveal that the labor share of the total cost of crop production was 41% in the Philippines vs. 22% in the U.S.[16]

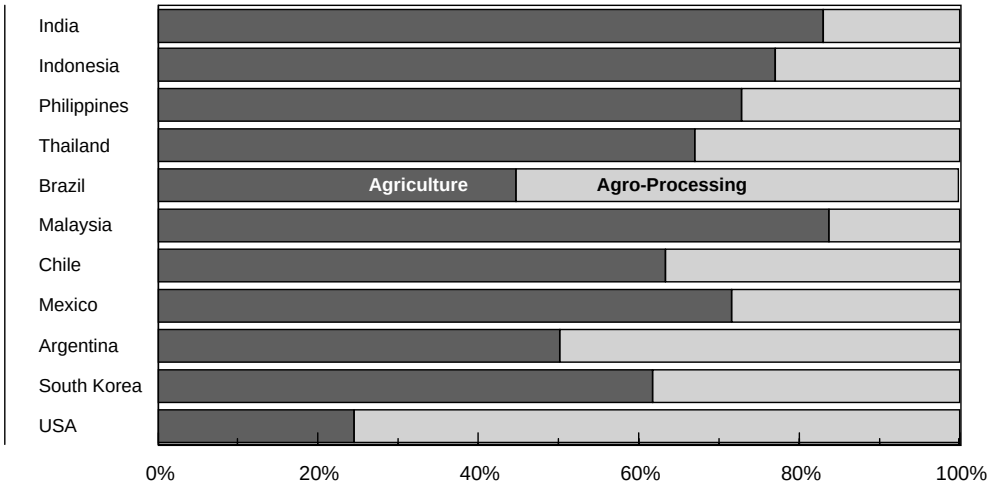
The combined agricultural sector in most developing countries is more labor-intensive than in the U.S. In most cases, total costs in less developed agribusiness sectors are predominantly made up of labor and land costs, net of indirect taxes and subsidies. Data from the GTAP tables show a

lower reliance on labor and land costs at higher levels of development, as shown in Chart 6. In India, Indonesia, and the Philippines, for example, the combined costs of labor and land (net of indirect taxes and subsidies) make up an average of 55% of the total costs of agriculture compared to less than 10% in the U.S. By contrast, the ***input*** of non-agricultural goods (often in the form of feedgrain, tractors, machinery, and energy) into agriculture is 44% in the U.S. vs. an average 17% in India, Indonesia, and the Philippines.[17]

Chart 7 contrasts the relative contribution of labor to the economy of both agriculture (narrowly-defined) and of agro-processing.[18] For example, in India the agricultural sector contributes 83% of the combined labor contribution of agriculture and agro-processing to the economy. As the agribusiness sector develops, however, job growth is leveraged into related sectors. As more food goes on to some form of processing and distribution, employment opportunities are created in food processing, trucking, warehousing, and retail establishments. Labor contributions to agro-processing are relatively high in countries with more developed agribusiness such as Brazil, Argentina, and the United States. Thus, there typically exists an excellent potential for rapid job growth in the affiliated agro-processing industries in less developed countries, as agribusiness matures and diversifies away from basic agriculture. Similar job opportunities are also created in input industries which supply goods and services to a more complex, developed agricultural sector.

Chart 7: Agribusiness Promotes Job Growth in Agro-Processing

Relative Labor Contribution to Agriculture and Agro-Processing



Source: Contribution of labor costs for agriculture and agro-processing relative to the combined total of labor costs for these two sectors, derived from the GTAP tables.

V. Policy Conclusions for Agribusiness Development

Agribusiness development is sometimes constrained by legal, political, and cultural conditions which stem from the very same inter-sectoral economic relationships upon which it draws its strengths. Biases against high-valued, large-scale agribusiness development, which are still present today in many developing countries, have prevented the agricultural sector from taking advantage of the many potentially available linkages to other sectors of the economy. Many of

the problems facing agribusiness development in developing countries seem to recall Davis and Goldberg's view that the distinction between agriculture and industry as separate economic sectors can become clouded. In India, for example, agribusiness activities are treated significantly differently by government regulatory and tax authorities depending on their classification as "agriculture" or "industry". In many developing countries, land tenure law still exists to promote small-scale, on-the-farm agriculture production. Austin (1992) calls this the "analytical schizophrenia" associated with developing countries' policies toward agribusiness development -- the uncertainty and, sometimes, the conflict between viewing agribusiness as either an agricultural activity or one of manufacturing.

Elements of early development policy, some of which unfortunately remain today, continue to promote the urban-rural bias and industrial development as the leading sector of development. The agricultural sector was viewed as a low-wage, low-productivity sector and therefore assumed to be not as important as manufacturing. Besides these views, already discussed in the Introduction, agribusiness development has been hindered by approaches to food security through small-scale agricultural self-sufficiency. Principally these confused policies arise because of the traditional separation of agriculture and non-agricultural (industrial) sectors -- difficult to promote policy reform while maintaining a small-scale agricultural sector to promote food security through food self-sufficiency. For example, India's first five-year plan (1951-56) adopted an agricultural strategy that was based on small-scale, community-based development in order to create a decentralized food system resistant to wide-scale famine. Although this system worked extremely well for decades in terms of eliminating the kind of wide-scale famine found in India at the time of its independence, in more recent years the bias toward small-scale agriculture has prevented agribusiness activities from flourishing.

Government policies can affect the choice of inputs, infrastructure investment, farm production, transportation, storage, processing & distribution, and exporting. These policies can be categorized into five main categories: (1) trade policy; (2) monetary policy; (3) fiscal policy; (4) labor policy; (5) income/output pricing policy; (6) regulation policy.

Trade Policy -- duties and quotas on imports (especially for inputs used by agribusiness), taxes and subsidies on exports (which may distort relative prices of agribusiness products). Restricted access to foreign exchange often limits the ability to use imported goods in agribusiness production. Foreign exchange is often rationed when the exchange rate is over-valued-- this, too, acts against agribusiness by making exports more expensive.

International trade can be used to promote agribusiness development. High quality inputs such as farm machinery, seed, fertilizer, and pesticides may be more cheaply available through imports than in domestic markets. High tariff rates designed to protect domestic markets against foreign competition may actually stifle the development of the agribusiness sector. It has been suggested that countries with average tariff rates of more than four times the average rate prevalent in the European Union and the United States of 5-6%, i.e. about 20-25%, will not be able to use trade to promote agribusiness development.[19] While many countries have been reducing tariff rates in accordance with the WTO, Table 9 shows that tariff rates are still too high.

Table 9: Average Tariffs on Imported Goods

	Primary Goods	All Goods
USA (1995)	5.5%	5.9%
Brazil (1994)	8.2%	11.9%
South Korea (1996)	21.0%	11.0%
Thailand (1993)	40.3%	45.6%
Malaysia (1993)	10.9%	14.3%
Argentina (1995)	8.5%	10.5%
Chile (1992)	11.0%	11.0%
Indonesia (1993)	16.7%	19.4%
Mexico (1995)	12.3%	12.6%
India (1990)	74.1%	81.8%
(1997)	25.7%	30.0%
Philippines (1993)	23.9%	22.5%

Source: World Bank, *World Development Indicators*. Calculated from data provided by the UNCTAD Trade Analysis Information System.

Monetary Policy money supply, government influence on interest rates can affect the affordability of capital good inputs such as seed and the choice of technology; banking & credit regulations (which may affect the availability of credit to agribusiness).

Fiscal Policy Government spending on infrastructure, direct government spending through investment and ownership (SOE and parastatal participation), government provision of services, and direct transfer payments. Taxes are often levied on leases and purchases of agricultural land, and goods and services associated with the transportation, storage, processing, and distribution of agricultural outputs. Government fiscal policies also affect irrigation, research, and investment in transportation networks and warehousing. Subsidies are often applied to some agricultural inputs such as water, fertilizer, and pesticides.

Labor Policy minimum wage, labor codes, social security and other benefits, public sector wage and employment policies.

Income/Output Pricing Policy Government control of consumer and producer prices affects the profitability of the agribusiness production chain.

Regulatory Policy Enterprise licensing, monopoly privileges, land allocation and tenure, zoning restrictions. Includes also the regulations pertaining to safety, health, quality, and consistency.

The size of the agriculture and agribusiness increase as development occur and the interactions with the other sectors of the economy become more complex. The data indicate that profound transformations take place in these sectors as development occurs. Many countries have tended to pursue development strategies focusing on non-agricultural sectors, believing that higher productivity growth stems from non-agricultural sectors. However, rapid economic growth involving a transition from a mostly agrarian economy to a more diverse economic base must

include a modernization of the agricultural sector, and can be built around the modernization and development of linkages in affiliated agribusiness sectors. ***Agribusiness promotion is an important development strategy because of the increasing linkages which develop between agriculture and other sectors of the economy.***

In many countries business development strategies or policy liberalization which affect the other sectors may be particularly targeted to avoid agribusiness and agriculture. Since these sectors are closely linked with food supply, food security and in many countries, a key export source of foreign exchange, they are often tightly controlled and face policy constraints not applicable to other sectors. Yet considering the strong potential of agricultural development to act as an engine of growth to the rest of the economy through its agribusiness linkages discussed in this paper, it makes good sense to focus policy reform efforts in this area.

Appendix A: Description of the Data

Source. "The GTAP 3 Data Base." Center for Global Trade Analysis. Purdue University. The GTAP database provides detailed, input-output country tables which describe the intersectoral linkages in a given economy.

Countries. We selected eleven countries at varying levels of economic development to approximate different levels of agribusiness development: South Korea, Indonesia, Malaysia, Philippines, Thailand, India, USA, Mexico, Argentina, Brazil, and Chile.

The GTAP 3 Data Base also makes available input-output tables for several other countries, and approximates input-output tables for aggregated geographic regions: Australia, New Zealand, Japan, Singapore, China, Hong Kong, Taiwan, Rest of South Asia (aggregate), Canada, Central America and the Caribbean (aggregate), Rest of South America (aggregate), European Union (aggregate), Austria-Finland-Sweden (aggregate), EFTA (aggregate), Central European Associates (aggregate), Former Soviet Union (aggregate), Middle East and North Africa (aggregate), Sub-Saharan Africa (aggregate), and Rest of World (aggregate).

Year. GTAP 3 data is for 1992 for all countries. Data are given in current U.S. Dollars.

Sectors. 37 sectoral categories at the disaggregated level, aggregated into:

Agriculture (8): paddy rice, wheat, other grains, non-grain crops, wool, other livestock, forestry, fishing.

Processed agriculture (8): Processed rice, meat products, milk products, other food products, beverages and tobacco, textiles, wearing apparel, leather etc.

Raw materials and minerals (4): Coal, oil, gas, other minerals.

Mfg. and industrial materials (12): Lumber and wood, pulp and paper, petroleum products, chemical products, mineral products, ferrous metals, other metals, metal products, transport equipment, other machinery, other manufacturing, electricity.

Services (5): Construction, trade and transport, private services, government services, dwellings.

Appendix B: Calculating Agribusiness Using the IO tables from the GTAP Project

This methodology applies the USDA definition of the Food and Fiber System (FFS), the modern term for agribusiness, to the data made available in the GTAP project's Input-Output tables.

Table B-1: The Components of Agribusiness

Agricultural Inputs	Example	Agricultural Outputs	Example
Value-added	Land, labor, capital	Final consumption and export of unprocessed agriculture	Fresh fruits and vegetables, eggs
Agricultural inputs into the agricultural sector*	Feedgrain, livestock	Agricultural inputs into the agricultural sector*	Feedgrain
Inputs of processed agriculture into basic agriculture	Processed feed and fertilizer, food oils	Agricultural components of food processing	Wheat inputs into bakeries, cotton
Inputs of other goods and services into agriculture	Chemical fertilizer, pesticide, energy, farm machinery, transportation, storage, marketing, distribution, and government services	Agricultural components as inputs into other sectors	Construction, restaurants, textiles, lard, lubricants, trees for lumber

* Only counted once to avoid double-counting.

Agribusiness consists of all those goods and services which are used as inputs into agriculture, as well as all the uses, both intermediate and final, of agricultural goods. Table B-1 lists the various components of agribusiness and some examples of each component. Most importantly it should be noted that the size of agribusiness components relative to each other varies greatly at different levels of agribusiness development.

A highly aggregated version of the GTAP IO table for the United States is presented in Table B-2 to serve as a guide for the calculation of the components of agribusiness. In general, IO tables show the flow of goods and services from source (input) to use (output). Reading the rows across shows how output is distributed either for intermediate use (as an input good in another sector) or for final demand (private or government consumption, investment, or export). The columns read vertically shows the level of input (of various intermediate goods) into each sector, and the amount of value added by land, labor, capital, and taxes to those goods to produce the good identified by the column header.

<u>Reading the Rows Across as Inputs into the Columns</u>

The rows present the use of a given commodity or factor input. For example, the row titled "All Intermediate Agric" describes the domestic use of all agricultural commodities. Reading across, one can see that $62.2 billion stays in agriculture, $111.2 billion is used as an input in agro-processing, and $28.2 billion is used as an input in various other sectors of the economy. Continuing across the row, one can also determine that $66.6 billion worth of domestically-produced agricultural commodities are consumed by final demand, mainly through household

consumption ($33.3 billion) and exports ($31.5 billion). The total output value of the domestic agricultural sector is $268.2 billion. ("Value-added in agriculture", the traditional measure of the size of the agricultural sector, is measured by the total final demand of agriculture.)

The uses of other commodities and the factor inputs (labor, capital, land, and indirect taxes) are presented in the other rows of Table B-2 in a similar manner. Note that GNP can be calculated by the final demand equation by adding the final demand of investment, household consumption, government spending and (net) exports of all commodities -- Y=C+I+G+X-M.

Reading the Sector Requirements Down a Column

Each of the columns lists the inputs going into each sector of the economy. Reading down the column titled "Agriculture", for example, one can see that the total output of agriculture requires inputs from domestic agricultural production of $58.6 billion, $2 billion of imported agricultural commodities, and services paid for by $1.6 billion in domestic taxes and $28 million in import taxes. Continuing down, agricultural output requires $15.7 billion of agro-processing inputs, and $91.5 billion of inputs from all other sectors. Agriculture also requires $34.8 billion worth of labor, $43.7 billion of capital, and $15.9 billion of land. Lastly, note that agriculture benefits indirectly from $21.4 billion in taxes elsewhere in the economy.

The total input costs of the sector are $242.3 billion. Thus, the total input costs are equivalent to the output value (sales) of the sector, as is true for all sectors of the economy. Also note that GNP can be calculated by the value-added equation by summing labor, capital, land, and indirect tax costs for all commodities -- Y=L+K+N+T.

Using the Input-Output Table to Calculate Agribusiness

Commodity inputs used by agricultural production are found in the column titled "Agriculture." The total commodity use is in the row titled "Intermediate Use": $169.4 billion. Also added into agribusiness are the value-added inputs of land, labor, capital, and indirect taxes (TSR) into agriculture: $73.0 billion. The uses of agriculture as inputs into other sectors are listed in the row titled "All Intermediate Agric"; the total in the column titled "Total Sales": $268.2 billion. Note, however, that agricultural inputs used in other agricultural production (mainly feedgrains and livestock breeding) are counted as both an input and an output. The inter-sectoral total, $62.2 billion, is therefore subtracted from the total to eliminate the double-counting. The sum of the intermediate inputs and outputs related to agriculture, less the agricultural inter-sectoral total is $169.4 billion plus $73.0 billion plus $268.2 billion minus $62.2 billion, or $448.3 billion.

Sources and References

Austin, James E. Agroindustrial Project Analysis: Critical Design Factors. 1992.

Davis, John and Goldberg, Ray. A Concept of Agribusiness. Chapter 3: "Agribusiness and Input-Output Economics." 1957.

Edmonson, et. al. "Measuring the Economy wide Effect of the Farm Sector: Two Methods." USDA Economic Research service Technical Bulletin Number 1843. July 1995.

Hirschman, Albert O. The Strategy of Economic Development. New Haven: Yale University Press. 1958.

Mellor and Johnston, "The World Food Equation: Interrelations Among Development." Journal of Economic Literature. Volume 22, pp. 531-74. 1984.

Lee, et. al. "Measuring the Size of the U.S. Food and Fiber System." USDA Economic research Services. Agricultural Economic Report Number 566. March 1987.

Morgan, Larry. "The Role of the Agriculture and Natural Resources Sector in the Philippines Economy: An Interindustry Analysis." Chemonics International for USAID. August 1990.

Newman, Mark D., Richard Abbott, Liana C. Neff, Joanne Yeager, Merle Menegay, David Hughes, and James Brown. "Agribusiness Development in Asia and the Near East." Agricultural Marketing Improvement Strategies Project, Abt Associates Inc. 1989.

Ouédraogo, Ismael, et. al. "The Contribution of Agribusiness to National Income and Employment in North Africa and the Near East. Volume I: Main Document." Abt Associates Inc. USAID APAP II Report No. 348. March 1993.

Rostow, Walt W. Stages of Economic Growth. (1960).

Schiff, Maurice; Alberto Valdes. The Plundering of Agriculture in Developing Countries. Washington, D.C, The International Bank for Reconstruction and Development/ The World Bank, 1992.

Swanberg, Kenneth G. "The Role of Agribusiness in Asia." Development Alternatives, Inc. USAID Regional Analytical Report No. 2. December 1994.

ENDNOTES

1. Rostow (1960).

2. Hirschman (1958). The most simplistic interpretation of this approach is that countries should do everything they could to promote the industries that had the greatest combinations of forward and

backward linkages with other sectors.

3. This flowchart is adapted from Exhibit 3 (pg. 30) of Davis and Goldberg. The role of imported inputs and exported goods in the agribusiness system is not included in this flowchart. Also not presented are the inputs of the factors of production: land, labor, capital, and indirect taxes.

4. They use the term Food and Fiber System (FFS) to be consistent with the terminology of the USDA. We use "Agribusiness", "Food and Fiber System", and "FFS" interchangeably throughout this paper.

5. Abt Associates, "The Contribution of Agribusiness to National Income and Employment in North Africa and the Near East". The authors did not use input-output tables, but estimated agribusiness contribution to the economy using highly-detailed, 4-digit SIC breakdowns of value-added, national income tables.

6. See page ii of Newman and Oedrago, March 1993.

7. Lee et. al. "Measuring the Size of the U.S. Food and Fiber System." March 1987.

8. Edmonson, et. al. "Measuring the Economywide Effect of the Farm Sector: Two Methods." July 1995.

9.A fixed-effects regression model allows a slope line to be fit on the data without forcing the intercept to be the same for each country set.

10. The 1947 input-output table is from Davis and Goldberg (1957). The 1992 input-output table for the U.S. economy, shown in Table 3, indicates that intermediate demand for Agriculture was $201.6 billion, approximately 75% of the total agricultural sales of $268.2 billion.

11. From James Austin's 1992 book, Agroindustrial Project Analysis: Critical Design Factors. Since the data are calculated from the sum of shares of value-added in food, beverages, and tobacco plus textiles & clothing, this methodology does not directly compare with Input-Output Analysis, but has more in common with Newman, et. al. (1993) and Ouédraogo, et. al. (1993).

12. The ratio of agroindustrial processing is the ratio of value added by food, beverage, and tobacco manufacturing to the sum of (1) value added by agriculture; and (2) value added by food, beverage, and tobacco manufacturing. The regression was:

$$\text{Ratio of agricultural processing} = \underset{(.030)}{0.31} * \text{LOG}_{10}(\text{GNP per capita}) - \underset{(.109)}{0.81}$$

N = 73 countries in 1990 R Sq. = 60%

Regression results were almost identical for 75 countries in 1985 and 69 countries in 1995.

13. See Table 4 for the data. Measured using the sum of value-added (land, labor, capital, and taxes) to agriculture (35.7% of agribusiness in India), and domestic consumption (33.9%) and exports of of un-processed agriculture (1.2%).

14. From a survey by the Federation of Indian Chambers of Commerce and Industry (FICCI), “Food Processing Industry. A Profile.”

15. Larry Morgan (August 1990). Page 3.

16. Percentages are calculated by summing the labor costs of paddy rice, wheat, “other grains”, and “non-grain crops”, and dividing this total by the sum of the total costs.

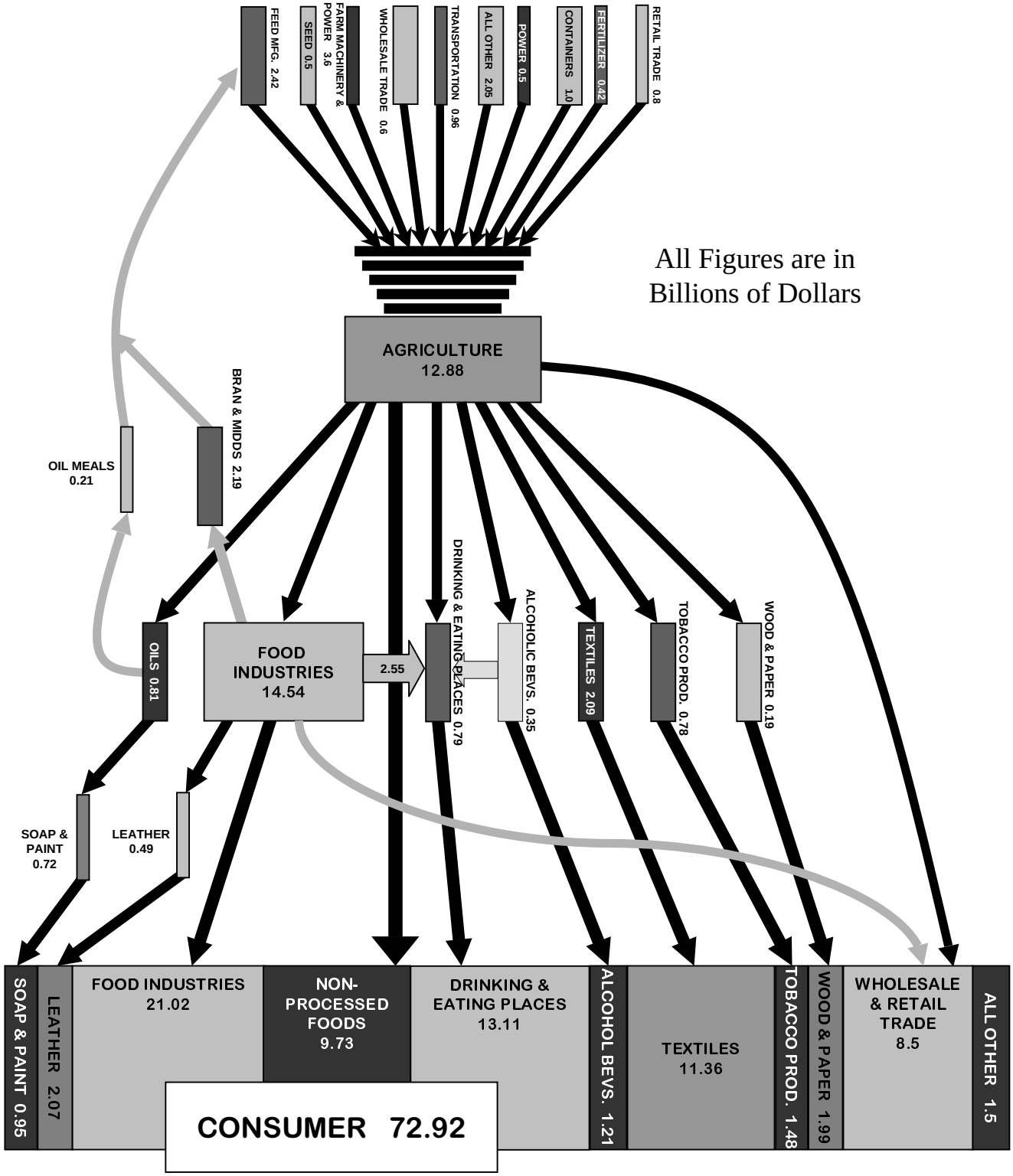
17. The combined cost of labor, land, taxes, and subsidies is high in Argentina and South Korea because of unusually high land and labor costs associated with the production of protected or subsidized sectors: beef and other livestock in the case of Argentina, and paddy rice in the case of Korea. Combined land and labor costs for these two cases greatly exceeded 50% of the total costs, much higher than in the other countries examined where rice production and livestock may not be as strategically important.

18. The data in this chart are based on the sectoral divisions defined in Appendix A. Thus, “Agriculture” includes paddy rice, wheat, grain, crop, and livestock production, and “Agro-Processing” includes processed rice, meat packaging and processing, dairy, fruit and vegetable canning and processing, distilling, and segments of the apparel and textiles industries.

19. In a conversation with Larry Morgan, October 1997, it was suggested that agribusiness activities could stimulate development through its linkages to other sectors, but only if they are complemented by outward-directed trade and investment policies, and in particular, lower tariffs on imports. Other countries which had high average tariff rates in the early 1990s (1992-95) included: Bangladesh (50%), Cote d’Ivoire (26%), Kenya (34%), Pakistan (50%), Sri Lanka (29%), Tanzania (28%), and Egypt (23%).

Chart 1: Agribusiness Flow Chart

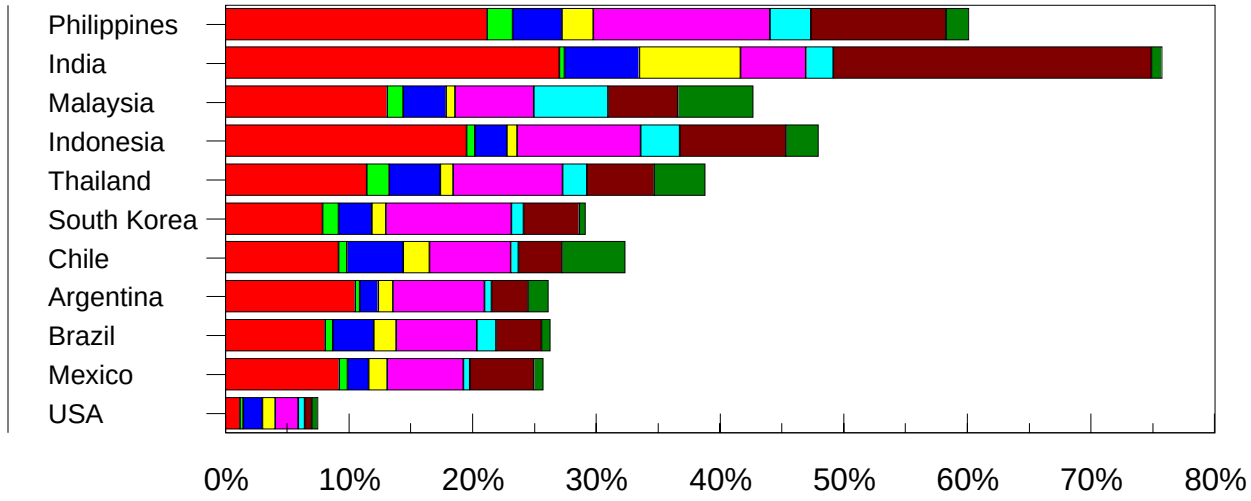
Size and Components of Agribusiness for the U.S. Economy in 1947*

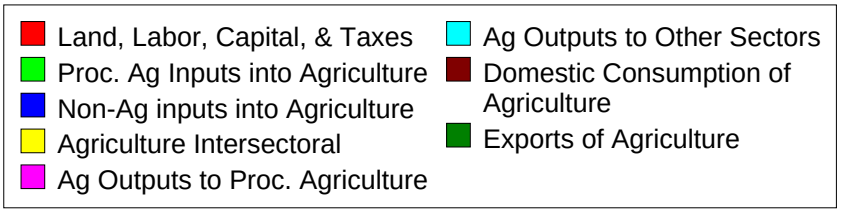


* Adapted from Davis and Goldberg (1957). The role of imported inputs and exported goods in the agribusiness system is not included in this flowchart. Also not presented are the inputs of the factors of production: land, labor, capital, and indirect taxes.

Chart 2: Agribusiness as a Share of GDP

Percent of GDP





Composition of Agribusiness

Percentage Breakdown

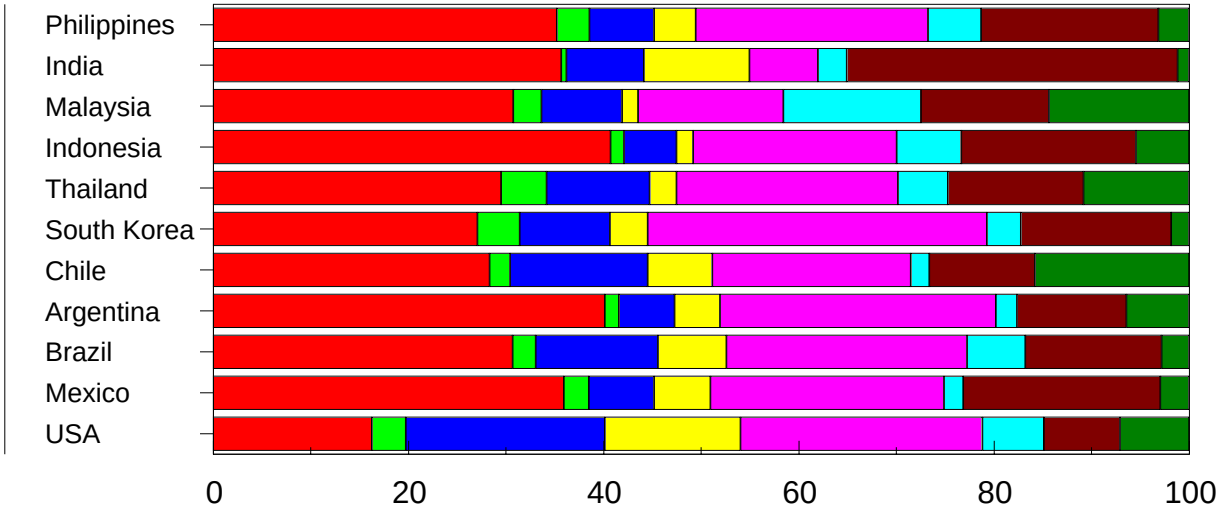
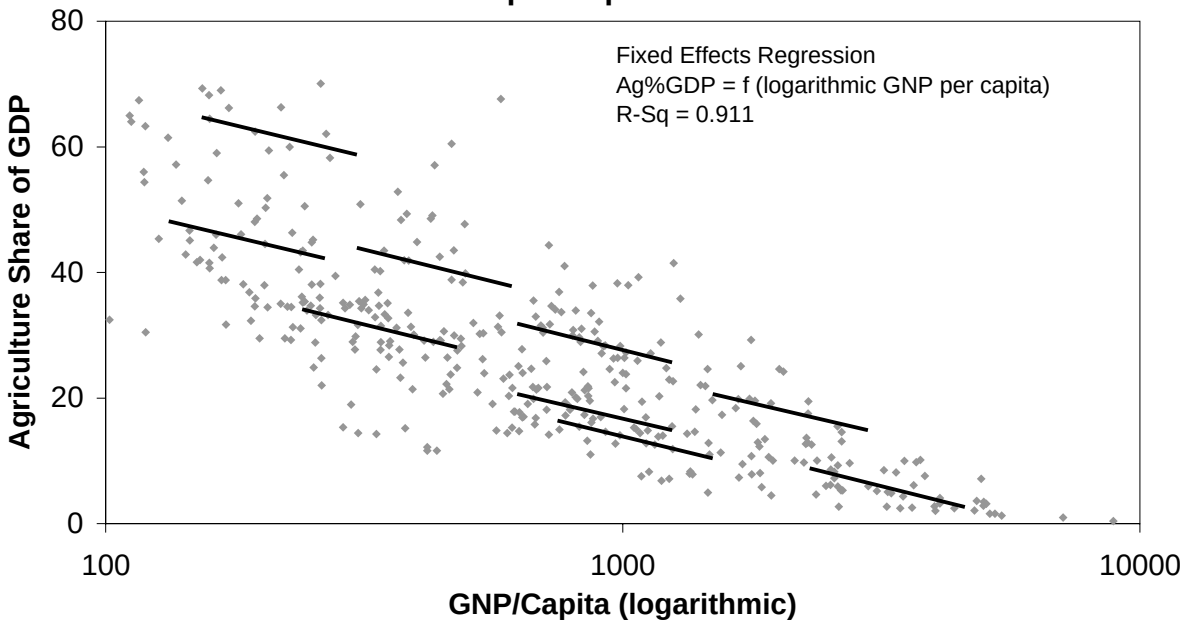
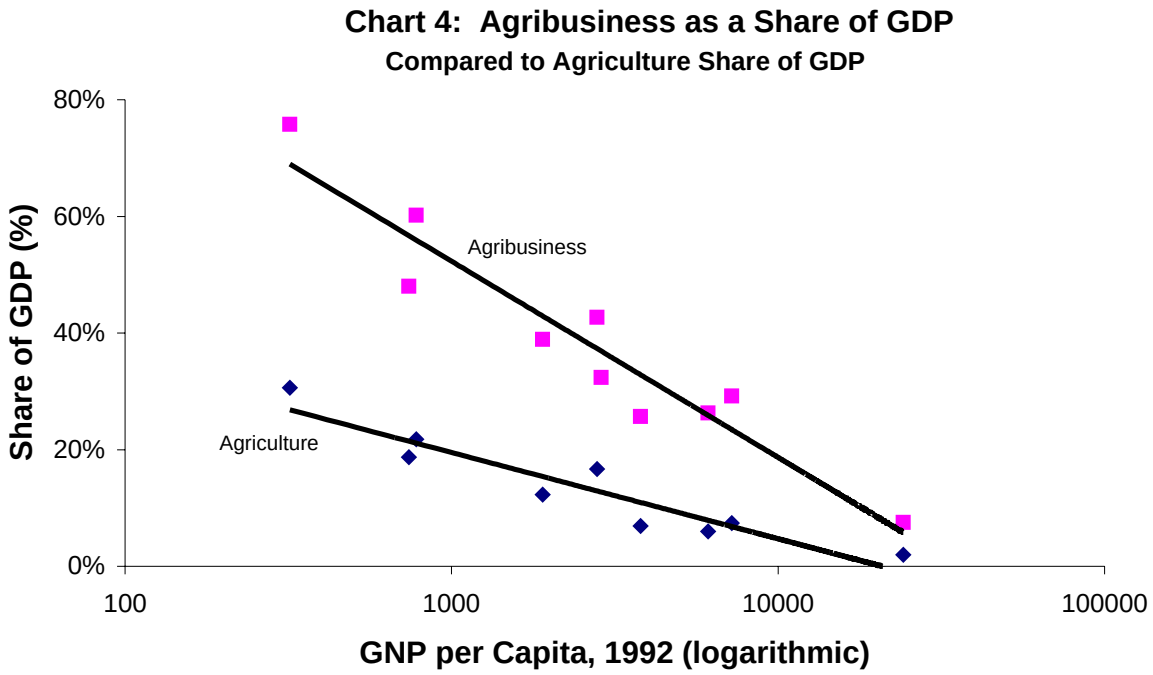


Chart 3: Agriculture's Share of GDP Declines as GNP per Capita Increases





As a Share of GDP

	Agriculture	Agribusiness	GNP per Capita
India	30.6%	75.8%	320
Indonesia	18.7%	48.0%	740
Philippines	21.8%	60.2%	780
Thailand	12.3%	38.9%	1900
Malaysia	16.7%	42.7%	2790
Chile	#N/A	32.4%	2870
Mexico	6.9%	25.7%	3790
Argentina	6.0%	26.3%	6110
Korea	7.4%	29.2%	7220
USA	2.0%	7.5%	24170

Table 3: Input-Output Table for the U.S. Economy in 1992

In Millions of Dollars

USA.WK4

AGRICULTURE												
Domestic Demand	58609.6	103015.7	24278.2	185903.5	21.8	22653.8	1247.4	32523.2	56446.2	242349.8		
Import Demand	2000.1	6187.8	3614.4	11802.3	239.5	10205.3	221.3	0.0	10666.1	22468.3		
Domestic Taxes	1559.9	1868.9	316.5	3745.4	0.0	267.4	35.7	-975.9	-672.8	3072.6		
Import Taxes	28.4	95.6	35.0	159.0	0.0	137.4	0.0	0.0	137.4	296.5		
All Intermediate Agric	62198.0	111168.1	28244.1	201610.2	261.3	33264.0	1504.4	31547.4	66577.0	268187.2		
FOOD & FIBER PROCESSI												
Domestic Demand	15413.2	125606.7	92615.4	233635.2	2750.6	345783.9	10466.7	38106.3	397107.6	630742.8		
Import Demand	210.3	13849.6	8446.9	22506.8	1413.8	60658.0	1321.2	0.0	63393.1	85899.9		
Domestic Taxes	41.5	979.6	2344.8	3365.9	24.3	10992.7	34.9	-376.9	10674.9	14040.8		
Import Taxes	2.4	133.8	373.6	509.9	23.5	782.4	0.0	0.0	805.9	1315.7		
All Interm Fd & Fiber Proc	15667.4	140569.7	103780.8	260017.8	4212.2	418217.0	11822.9	37729.4	471981.4	731999.3		
ALL OTHER SECTORS												
Domestic Demand	82847.4	157956.5	3642481.6	3883285.4	782331.9	3172545.1	999077.7	543866.3	5497821.0	9381106.4		
Import Demand	4006.8	5003.9	289892.4	298903.1	117241.5	143788.4	26937.5	0.0	287967.4	586870.6		
Domestic Taxes	4512.7	5980.2	142125.9	152618.8	18548.1	224818.9	10512.0	313.6	254192.7	406811.5		
Import Taxes	130.1	93.2	7174.1	7397.4	904.2	4251.7	541.7	0.0	5697.7	13095.0		
All Intermediate Other	91497.0	169033.8	4081674.0	4342204.7	919025.7	3545404.2	1037068.9	544179.9	6045678.8	10387883.5		
ALL SECTORS												**Imports**
Domestic Demand	156870.166	386578.9	3759375.2	4302824.2	785104.3	3540982.9	1010791.8	614495.9	5951374.9	10254199.1		**excl Duties**
Imported Demand	6217.196	25041.3	301953.7	333212.2	118894.8	214651.8	28480.0		362026.6	695238.8	54698.1	640540.6
Domestic Taxes	6114.043	8828.7	144787.3	159730.1	18572.4	236079.0	10582.6	-1039.2	264194.8	423924.9		
Import Taxes	160.969	322.6	7582.7	8066.3	927.7	5171.5	541.7		6640.9	14707.2		**Y=C+I+G+X-M**
All Commodity Use	169362.374	420771.5	4213698.9	4803832.8	923499.2	3996885.2	1050396.1	613456.7	6584237.2	11388069.9		**5943696.6**
Labor	34762.230	107366.9	3365298.4	3507427.5						3507427.5		
Capital	43680.340	104723.3	1802109.2	1950512.8						1950512.8		
Land	15906.374	0.0	0.0	15906.4						15906.4		
TSR	-21361.573	-2118.7	0.0	-23480.2						-23480.2		
Value-Added	72987.371	209971.5	5167407.6	5450366.5						5450366.5		
Total Costs	242349.7	630743.0	9381106.5	10254199.2	923499.2	3996885.2	1050396.1	613456.7				
									Duties, oth taxes	493330.2		
									Y=L+K+N+T	**5943696.7**		

Table 4: Composition of Agribusiness in 1992

Millions of Dollars

	Land, Labor, Capital, & Taxes	Proc. Ag Inputs into Agriculture	Non-Ag inputs into Agriculture	Agriculture Intersectoral	Ag Outputs to Proc. Agriculture	Ag Outputs to Other Sectors	Domestic Consumption of Agriculture	Exports of Agriculture	Total Agribusiness	Total GDP
Philippines	11240.8	1087.6	2112.6	1355.9	7584.6	1743.7	5796.9	999.9	31921.9	53044.8
India	64867.7	1029.2	14445.0	19658.8	12727.2	5338.2	61618.9	2121.7	181806.7	239967.3
Malaysia	8527.5	811.6	2275.1	464.9	4114.0	3915.3	3639.8	3965.0	27713.2	64885.6
Indonesia	25090.8	847.5	3295.2	1079.5	12830.5	4055.8	11021.8	3350.6	61571.7	128303.5
Thailand	12788.2	2010.5	4570.7	1178.9	9826.3	2225.0	6016.2	4657.3	43272.9	111376.1
South Korea	24340.7	3924.3	8303.2	3479.7	31238.5	3104.4	13827.4	1648.7	89866.9	307998.0
Chile	3804.7	285.0	1895.8	886.4	2725.9	258.0	1452.3	2118.6	13426.7	41503.8
Argentina	23497.6	837.1	3324.0	2726.6	16533.5	1289.0	6537.2	3742.3	58487.3	223451.6
Brazil	32841.4	2526.5	13438.9	7492.9	26399.1	6375.9	14913.3	2995.6	106983.6	406396.2
Mexico	30331.6	2174.0	5606.7	4853.3	20213.7	1662.2	17007.2	2476.5	84325.2	327853.6
USA	72987.4	15667.4	91497.0	62198.0	111168.1	28244.1	35029.6	31547.4	448338.9	5943696.7

Components of Agribusiness as a Percent of GDP

Philippines	21.2%	2.1%	4.0%	2.6%	14.3%	3.3%	10.9%	1.9%	60.2%	100.0%
India	27.0%	0.4%	6.0%	8.2%	5.3%	2.2%	25.7%	0.9%	75.8%	100.0%
Malaysia	13.1%	1.3%	3.5%	0.7%	6.3%	6.0%	5.6%	6.1%	42.7%	100.0%
Indonesia	19.6%	0.7%	2.6%	0.8%	10.0%	3.2%	8.6%	2.6%	48.0%	100.0%
Thailand	11.5%	1.8%	4.1%	1.1%	8.8%	2.0%	5.4%	4.2%	38.9%	100.0%
South Korea	7.9%	1.3%	2.7%	1.1%	10.1%	1.0%	4.5%	0.5%	29.2%	100.0%
Chile	9.2%	0.7%	4.6%	2.1%	6.6%	0.6%	3.5%	5.1%	32.4%	100.0%
Argentina	10.5%	0.4%	1.5%	1.2%	7.4%	0.6%	2.9%	1.7%	26.2%	100.0%
Brazil	8.1%	0.6%	3.3%	1.8%	6.5%	1.6%	3.7%	0.7%	26.3%	100.0%
Mexico	9.3%	0.7%	1.7%	1.5%	6.2%	0.5%	5.2%	0.8%	25.7%	100.0%
USA	1.2%	0.3%	1.5%	1.0%	1.9%	0.5%	0.6%	0.5%	7.5%	100.0%

Each Component As a Percent of Total Agribusiness

Philippines	35.2%	3.4%	6.6%	4.2%	23.8%	5.5%	18.2%	3.1%	100.0%
India	35.7%	0.6%	7.9%	10.8%	7.0%	2.9%	33.9%	1.2%	100.0%
Malaysia	30.8%	2.9%	8.2%	1.7%	14.8%	14.1%	13.1%	14.3%	100.0%
Indonesia	40.8%	1.4%	5.4%	1.8%	20.8%	6.6%	17.9%	5.4%	100.0%
Thailand	29.6%	4.6%	10.6%	2.7%	22.7%	5.1%	13.9%	10.8%	100.0%
South Korea	27.1%	4.4%	9.2%	3.9%	34.8%	3.5%	15.4%	1.8%	100.0%
Chile	28.3%	2.1%	14.1%	6.6%	20.3%	1.9%	10.8%	15.8%	100.0%
Argentina	40.2%	1.4%	5.7%	4.7%	28.3%	2.2%	11.2%	6.4%	100.0%
Brazil	30.7%	2.4%	12.6%	7.0%	24.7%	6.0%	13.9%	2.8%	100.0%
Mexico	36.0%	2.6%	6.6%	5.8%	24.0%	2.0%	20.2%	2.9%	100.0%
USA	16.3%	3.5%	20.4%	13.9%	24.8%	6.3%	7.8%	7.0%	100.0%

Chart 5: Agribusiness Becomes More Complex and Interlinked

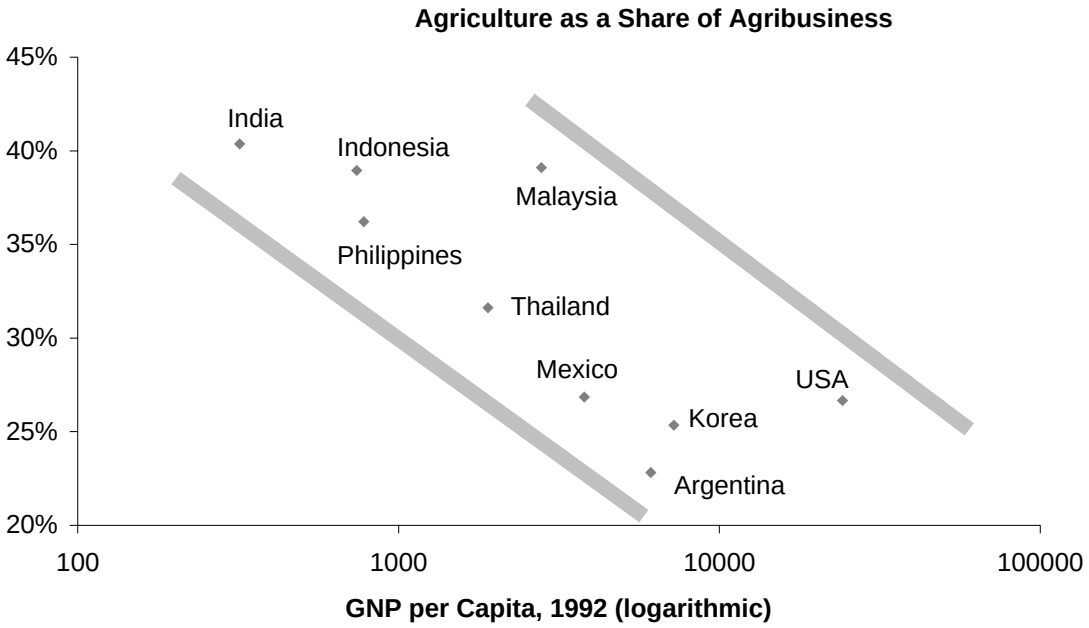
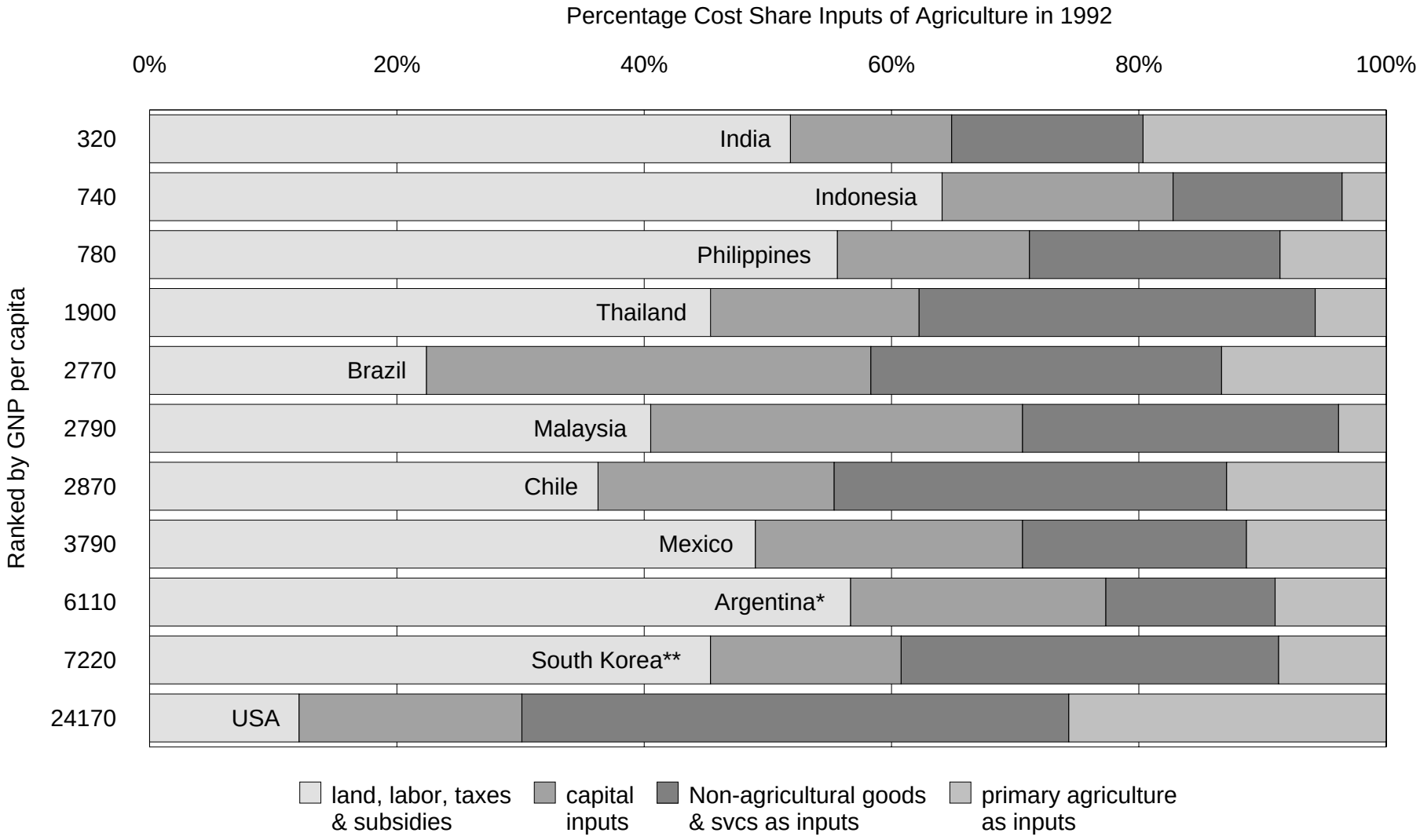


Chart 6: Agricultural Inputs Becomes More Diversified



.

* Argentina has unusually high land and labor costs associated with non-grain crops and beef and livestock production.

** South Korea has unusually high land and labor costs associated with non-grain crops and paddy rice production. See Endnote 17.

TABLE B-2: USING THE INPUT-OUTPUT TABLE TO CALCULATE THE SIZE AND COMPONENTS OF AGRIBUSINESS
U.S. Economy in 1992, in Millions of Dollars

Read the columns down as uses

Read the rows across as inputs

	Agriculture	Agro-Proc.	Intermediate Other	Intermediate Demand	Investment	Household	Gov't	Exports	Final Demand	Total Sales	Import Duties	
AGRICULTURE												
Domestic Demand	58609.6	103015.7	24278.2	185903.5	21.8	22653.8	1247.4	32523.2	56446.2	242349.8		
Import Demand	2000.1	6187.8	3614.4	11802.3	239.5	10205.3	221.3	0.0	10666.1	22468.3		
Domestic Taxes	1559.9	1868.9	316.5	3745.4	0.0	267.4	35.7	-975.9	-672.8	3072.6		
Import Taxes	28.4	95.6	35.0	159.0	0.0	137.4	0.0	0.0	137.4	296.5		
All Intermediate Agric	62198.0	111168.1	28244.1	201610.2	261.3	33264.0	1504.4	31547.4	66577.0	268187.2		
AGRO-PROCESSING												
Domestic Demand	15413.2	125606.7	92615.4	233635.2	2750.6	345783.9	10466.7	38106.3	397107.6	630742.8		
Import Demand	210.3	13849.6	8446.9	22506.8	1413.8	60658.0	1321.2	0.0	63393.1	85899.9		
Domestic Taxes	41.5	979.6	2344.8	3365.9	24.3	10992.7	34.9	-376.9	10674.9	14040.8		
Import Taxes	2.4	133.8	373.6	509.9	23.5	782.4	0.0	0.0	805.9	1315.7		
All Intermediate Fd Proc	15667.4	140569.7	103780.8	260017.8	4212.2	418217.0	11822.9	37729.4	471981.4	731999.3		
ALL OTHER SECTORS												
Domestic Demand	82847.4	157956.5	3642481.6	3883285.4	782331.9	3172545.1	999077.7	543866.3	5497821.0	9381106.4		
Import Demand	4006.8	5003.9	289892.4	298903.1	117241.5	143788.4	26937.5	0.0	287967.4	586870.6		
Domestic Taxes	4512.7	5980.2	142125.9	152618.8	18548.1	224818.9	10512.0	313.6	254192.7	406811.5		
Import Taxes	130.1	93.2	7174.1	7397.4	904.2	4251.7	541.7	0.0	5697.7	13095.0		
All Intermediate Other	91497.0	169033.8	4081674.0	4342204.7	919025.7	3545404.2	1037068.9	544179.9	6045678.8	10387883.5		
ALL SECTORS												**Imports**
Domestic Demand	156870.2	386578.9	3759375.2	4302824.2	785104.3	3540982.9	1010791.8	614495.9	5951374.9	10254199.1		**excl Duties**
Imported Demand	6217.2	25041.3	301953.7	333212.2	118894.8	214651.8	28480.0		362026.6	695238.8	54698.1	640540.6
Domestic Taxes	6114.0	8828.7	144787.3	159730.1	18572.4	236079.0	10582.6	-1039.2	264194.8	423924.9		
Import Taxes	161.0	322.6	7582.7	8066.3	927.7	5171.5	541.7		6640.9	14707.2		
												Y=C+I+G+X-M
Intermediate Use	169362.4	420771.5	4213698.9	4803832.8	923499.2	3996885.2	1050396.1	613456.7	6584237.2	11388069.9		**5943696.6**
Labor	34762.2	107366.9	3365298.4	3507427.5						3507427.5		
Capital	43680.3	104723.3	1802109.2	1950512.8						1950512.8		
Land	15906.4	0.0	0.0	15906.4						15906.4		
TSR	-21361.6	-2118.7	0.0	-23480.2						-23480.2		
Value-Added	72987.4	209971.5	5167407.6	5450366.5						5450366.5		
Total Costs	242349.7	630743.0	9381106.5	10254199.2	923499.2	3996885.2	1050396.1	613456.7				
									Duties, oth taxes	493330.2		
									Y=L+K+N+T	**5943696.7**		